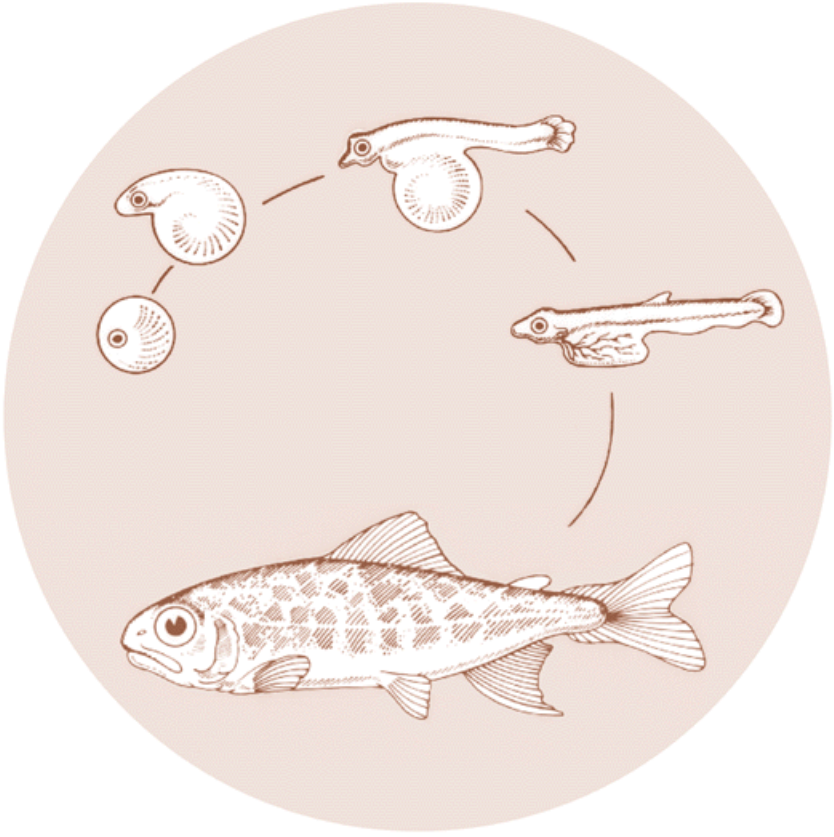
May 1996

HATCHERY EVALUATION REPORT
SPRING CREEK NATIONAL FISH HATCHERY - TULE FALL CHINOOK

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures



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P.O. Box 3621
905 N.E. 11th Avenue
Portland, OR 97208-3621

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HATCHERY EVALUATION REPORT

SPRING CREEK NATIONAL FISH HATCHERY - TULE FALL CHINOOK

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

Prepared by:

Montgomery Watson

Bellevue, WA 98005

Prepared for:

U. S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife
P.O. Box 3621
Portland, OR 97208-362 1

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Section 1

Executive Summary

This report presents the findings of the independent audit of the Spring Creek National Fish Hatchery (Tule Fall Chinook). The hatchery is located along the Columbia River at Underwood, Washington, approximately 30 miles upstream of Bonneville Dam. The hatchery is used for adult collection. egg incubation, and rearing of Tule Fall chinook.

The audit was conducted in April 1996 as part of a two-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination. (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995).* That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 98-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters sources
- The hatchery manager was asked to fill out and return the audit form
- A l-2 day site audit inspection visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Spring Creek National Fish Hatchery (Tule Fall Chinook) Audit Results

The Spring Creek National Fish Hatchery facility includes 44 Burrows ponds for adult holding and rearing, a circular "show" pond, and incubation facilities. Spring Creek National Fish Hatchery was constructed in 1900 and began operating in 1901. It was remodeled in 1955 under Mitchell Act authorization as part of the Columbia River Fisheries Development Program. In 1970, the U.S. Army Corps of Engineers razed and remodeled most of the facility as partial mitigation for lishery losses caused by construction of the John Day Dam.

The hatchery was in compliance with the majority of the performance measures. The audit found that the hatchery did not have information on some of the chemistry and contaminant parameters. In the area of facilities requirements. the release facility stresses the fish too much, eggs cannot be water hardened in iodophor, and the hatchery water may be too warm during the May release. The hatchery did not have a Genetics Monitoring and Evaluation Program in place.

The specific areas in which the Spring Creek National Fish Hatchery (Tule Fall Chinook Program) requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in order of occurrence on the questionnaire without intent of ranking or otherwise assigning priority:

- Monitor chemistry parameters on routine basis
- Monitor contaminants on routine basis
- Present release facility stresses the fish too much
- Modify incubation water supply to allow water hardening of eggs in iodophor
- Need ability to adjust water temperatures during May releases
- Develop genetics monitoring and evaluation plan for IHOT Operations Plan

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type I in Table 2, Section 3) were not listed above.

Section 2

Facility Description

Name:	Spring Creek National Fish Hatchery
Stock/Species:	Tule Fall Chinook
Operating Agency:	U.S. Fish & Wildlife Service
Funding Agency:	U.S. Fish & Wildlife Service
Location:	Spring Creek NFH is located on the north side of the Columbia River at Underwoood, Washington, approximately 30 miles upstream of Bonneville Dam at an elevation of 93 feet above sea level.
Address:	Spring Creek National Fish Hatchery Mile Post 61.75 R State Road 14 Underwood. WA 9865 1
Hatchery Manager:	Mr. Ed LaMotte
Phone	(509) 493-1730
Fax:	(509) 493-2980
Purpose:	Spring Creek NFH was constructed in 1900 and began operating in 190 I. It was remodeled in 1955 under Mitchell Act authorization as part of the Columbia River Fisheries Development Program. In 1970, the U.S. Army Corps of Engineers razed and remodeled most of the facility as partial mitigation for fishery losses caused by construction of the John Day Dam. This hatchery provides fish to the ocean and river fisheries.
Production Goal:	15 to 30 million fish to a smolt size of 35 to 11 0/lb for release in March, April, and May. Fish in excess of the hatchery's rearing capacity are placed in large holding ponds and volitionally released in the Bonneville Pool starting in February.
Water Supply:	A series of springs north of State Road 14 (2.250 to 4,000 gpm) A well used to adjust rearing temperature (1000 gpm) Reuse system (30,000 gpm)
Facilities:	
Incubation:	292 16-tray vertical stack incubator (do not use top tray)
Adult Holding	44 Burrows ponds (3,332 cf each)

Raceways	44 Burrows ponds (3,332 cf each)
Ponds	1 circular “show” pond

Section 3

Compliance Status

The hatchery audits arc based on compliance with written IHOT performance measures. These performance measures are documented in ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** (referred to *as IHOT 1995* in this report). [1] The purpose of the performance measures is to implement new hasinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason. the hatchery operations audited included broodstock collection, spawning. incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations. and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 98 page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Section 7 includes general information needed for the audit:

Section 1	Performance Measures for Program Objectives (PMs l-4)
Section 2	Performance Measures for Facility Requirements (PMs 5-15)
Section 3	Performance Measures for Hatchery Practices (PMs 16-25)
Section 4	Performance Measures for Fish Health Policy (PMs 26-34)
Section 5	Performance Measures for Ecological Interactions (PMs 35-38)
Section 6	Performance Measures for Genetics Policy (PMs 39-43)
Section 7	Performance Measures for General Information (PMs General l-2)

Several performance measures are repeated in various sections of the audit. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by light gray shading.

The Hatchery Audit Process

The hatchery audit will be conducted over a two-year period that concludes in 1997. This report covers phase one of the audit, which consists of an audit of four hatcheries and seven species or stocks of fish. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and on-site visits. The site visits were conducted from March 4 to March 8.

The following is the five step audit process:

'Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries,* Bonneville Power Administration, Portland, Oregon.

1. Information was obtained from headquarters sources.

2. The hatchery manager was asked to till out and return the Audit Farm.

3. A l-2 day site audit inspection visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.

4. A Compliance Report was developed to document the compliance status of each performance measure. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative.

5. This information was used to develop a draft Hatchery Evaluation Report. Based on review and comments of this prototype document, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Spring Creek National Fish Hatchery (Tule Fall Chinook)

This section documents the compliance status of the Spring Creek National Fish Hatchery (Tule Fall Chinook). Each performance measure is presented in a table taken from the audit form (Table 1). The compliance status is identified by the following categories:

- N/A (not applicable)
- Yes (in compliance)
- ? (unknown; generally due to unavailability of information to determine compliance)
- No (not in compliance).

Remedial actions arc suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4, where the cost of the required remedial actions is also presented.

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) With Performance Measures

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#1	Are the hatchery programs outlined in a subbasin management plan?		✔			Columbia Basin System Planning Production Plan, U.S. vs. Oregon, Columbia River Fish Management Plan	
#2	Is the hatchery operating under a current hatchery operational plan?		✔			IHOT & Spring Creek 5-Year Production Plan	
	Is it understood by staff!		✔				
	Is it being followed?		✔				
#3	Is a hatchery monitoring and evaluation plan in place?		✔			Hatchery Monitoring and Evaluation Plan	Include Monitoring and Evaluation Plan in IHOT Operations Plan
#4	Specific performance measures include:						
#4a	4dult contribution to fisheries, spawning grounds and hatchery	✔					
#4b	Adult pre-spawning survival as compared with established goal		✔			In compliance 5 out of last 5 years	
#4c	Egg-take as compared with established hatchery goal		✔			In compliance 5 out of last 5 years	
#4d	Green-egg-to-eyed-egg survival as compared with established goal		✔			No goal listed in IHOT Operations Plan	
#4e	Eyed-egg to fry survival as compared with established goal		✔			No goal listed in IHOT Operations Plan	
#4f	Fry-to-smolt survival as compared with established goal		✔			Review of records	
#4g	Production as compared with established goal		✔			Review of records	
#4h	Percent survival (smolt to adult) as compared with established goal				✔	In compliance 0 out of last 2 years	Need improved ocean survival

Table I Spring Creek National Fish Hatchery Compliance (**Tule** Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#4i	Number of eggs, fry, fingerlings, **smolts** and/or adults to meet basinwide needs	✔					

Table 1 Spring Creek National Fish Hatchery Compliance (‘Me Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	N o		
#5	Water quality						
#5a	‘Temperature						
	Do your water temperatures meet the criteria for spawning’!		✔			Rcvicw of records/Discussion	
	Do your water temperatures meet the criteria for incubation’!		✔			Review of records/Discussion	
	Do your water temperatures meet the criteria for rearing’?		✔			Review of records/Discussion	
#5b	Dissolved gases						
	Is the oxygen level near saturation?		✔			Review of records/Discussion	
	Is the dissolved nitrogen level less than saturation?		✔			Review of records/Discussion	
#5c	Chemistry						
	Ammonia (un-ionized)		✔			Review of records/Discussion	
	Carbon Dioxide			✔		No data	Run analysis
	Chlorine			✔		No data	Not a significant parameter at this site
	pH		✔			Rcvicw of records/Discussion	
	Copper		✔			Review of records/Discussion	
	Hydrogen Sulfide		✔			Review of records/Discussion	
	Iron		✔			Rcview of records/Discussion	
	Zinc		✔			Review of records/Discussion	
#5d	Turbidity						
	Does your turbidity meet the criteria?		✔			Review of records/Discussion	
#5e	Alkalinity and hardness						
	Does your alkalinity and hardness meet the criteria?		✔			Review of records/Discussion	
#5f	Nitrite						
	Does your nitrite meet the criteria?		✔			Review of records/Discussion	

Table 1 Spring Creek National Fish Hatchery Compliance (**Tule** Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				**Basis** for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#5g	Contaminants						
	Aldrin		✔			Review of records	
	Endrin		✔			Review of records	
	Dicldrin		✔			Review of records	
	Hcptachlor		✔			Review of records	
	Chlordane		✔			Review of‘ records	
	Methoxychlor		✔			Review of records	
	Lindane		✔	✔		No data	Run analysis
	Malathion					Review of records	
	Guthion			✔		No data	Run analysis
#5h	Pathogens						
	What portions of the hatchery have disease-tree water?						
	Adult holding?				✔	Have had ERM & Ick problems	Do not appear to bc serious problems
	Incubation’?				✔		
	Earlyrearing?				✔		
	Rearing?				✔		
	Others?						

Table 1 Spring Creek National **Fish** Hatchery Compliance ('Me Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance **Status**				**Basis** for Compliance or Non-Compliance	Remedial Action Needed for Corn **pliance**
		N/A	Yes	?	No		
#6	Alarm Systems						
	Do the following areas have alarms'!						
	Intake'?		✔			Inspection of facilities/ Discussion	
	Large rearing ponds and adult holding ponds?		✔				
	Raceway headboxes and rearing ponds?		✔				
	Incubation facilities?	✔					
	Quarantine areas and facilities?		✔				
	Water treatment systems'!		✔				
	Security?		✔				
	Arc there outside systems and buzzers in on-site residences'?		✔				
	Are water flow alarms checked daily?		✔			Discussion	
	Are all other alarms checked weekly?		✔			Discussion	
	Is there a log of alarms for emergencies, tests, and maintenance requirements		✔			Review of records/Discussion	
	Arc telephone pagers used'?					Discussion	
#7	**Adult** collection and holding facilities						
	Do you meet the adult holding criteria?		✔			Review of records/Discussion	
#8	Incubation facilities						
	Type 1: Vertical tray Do you have an adequate number of uni ts for the overall program'?		✔			nspection of facilities/Discussion	
#9	Rearing facilities						
	Type 1: Burrows Ponds Do you have an adequate number of units for the overall program?		✔			nspection of facilities/Discussion	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#10	Screening facilities						
	Do you meet the approach velocity criteria:	✔				Spring or groundwater sources; no intake	
	Are the fish screens regularly cleaned'!	✔					
	Arc rearing containers double screened for fish that should not be released to adjacent water?	✔					
#11	Predator control facilities						
	Arc your predation control facilities effective?		✔			Inspection of facilities/Discussion	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	3	No		
#12	Food storage facilities and quality control						
	Does the storage of dry/semi-moist/moist foods follow food manufacturer's recommendations? (dry<12%; semi-moist 12-20%; moist >20% moisture)		✔			Dry feeds used within 1 month	
	Does a regional quality control officer oversee production procedures and monitor:						
	Verification by feed manufacturer that ingredients meet specifications?		✔			Discussion	
	Ensure feeds do not contain unwanted drugs or other additives?		✔			Discussion	
	Analyze ingredients contained in the final food product to ensure that feed specifications have been met'?		✔			Discussion	
	Are the storage and handling of foods followed according to the following criteria'?						
	Moist pellets should not exceed 10°F at point of delivery?	✔				Discussion	
	Moist pellets should be removed from freezer just prior to feeding?	✔	✔			Discussion	
	Do not leave buckets of feed or feed containers outside exposed to light or heat?		✔			Discussion	
	Open bags of feed should be fed within one to two days except when feeding small groups of fish'!					Discussion	
	Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	✔				Discussion	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#13	Release facilities Do the release facilities ensure that fish are not subjected to adverse conditions?				✔	Fish are not volitionally released: present facilities stresses fish too much	Not sure how the release facilities would be improved
#14	Pollution abatement facilities Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)'?		✔			Inspection of facilities/Discussion	
	Are pollution abatement facilities operated correctly?		✔			Discussion	
#15	Transportation facilities Are the transport systems adequate to meet IHOT performance measures for transportation practices?	✔				No transportation of fish for this program	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#16	**Broodstock selection practices**						
	Is the donor selection process document attached?	✔				Existing program: does not apply	
	Was the donor selection outline followed in selecting the hatchery broodstock?	✔				Existing program: does not apply	
	Go to PM #40 in Genetics						
#17	**Spawning practices**						
	Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?		✔			Review of records/Discussion	
	Go to PM #42 in Genetics Section						
#18	**Incubation practices**						
	Are specific incubation standards listed in the hatchery operations plan?		✔			In hatchery Operations Plan, not IHOT	Include in IHOT Operational Plan
	Are incubation practices written?		✔			Review of plan	
	Incubation Type 1: Vertical Tray See PM #8) Do you meet the loading and flow criteria?		✔			Review of records/Discussion	
#19	**Rearing practices**						
	Are specific rearing standards listed in the hatchery operations plan?		✔			In hatchery Operations Plan, not IHOT	Include in IHOT Operational Plan
	Are rearing practices written?		✔			Review of rearing standards	
	Rearing Unit Type 1: Burrows Ponds (see PM 9)		✔				
	Do you meet the density and DI criteria?		✔			Rcvicw of records/Discussion	
	Do you meet the Loading and FI criteria?					Reviow of records/Discussion	
#20	**Smolt quality**						
	Do you produce a high quality smolt?		✔			Personal opinion of hatchery management	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#21	**Fish health management practices**						
	Are the monthly hatchery monitoring visits being conducted? (PM #26)		✔			Review of records/Discussion	
	Are the annual broodstock inspections being conducted? (PM #27		✔			Review of records/Discussion	
	Is there pathogen-free water and are the sanitation procedures being followed? (PM #28)				✔	No pathogen-free water; cannot USC iodophone to treat eggs	Modify incubation water supply/ discharge piping
	Are the following water quality parameters within criteria? (PM #5a-5h)		✔			Review of records/Discussion	
	Water temperature		✔			" "	
	Dissolved gases		✔	✔		No CO_2 or chlorine analysis	Run analysis
	Chemistry		✔			Review of records/Discussion	
	Turbidity		✔			"	
	Alkalinity and hardness			✔		"	
	Nitrite		✔				Run analysis
	Contaminants					Two compounds missing	
	Are rearing standards being followed? (PM #19)	✔				Review of records/Discussion	
	Are egg and fish transfer/release requirements met? (PM #31)					Review of records/Discussion	
#22a	Does hatchery performance meet requirements outlined in the regional hatchery policies and in suhbasin and hatchery plans for the following areas:						
#22a1	Percent **smoltification**						
	Do you measure percent smoltification?		✔			ATPase, condition factor; seawater challenge	
	Did you meet the smoltification criteria'?	✔				No goal found	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#22a2	Rearing density (prior to release)						
	Did you meet the rearing density criteria just prior to release?		✔			Review of records/Discussion	
#22a3	Disease condition (at release)						
	Did you meet all disease regulations just prior to release'?		✔			Review of records/Discussion	
#22a4	Number (at release)						
	Did you meet the release number goal'!		✔			In compliance last 2 years	
#22a5	Size at release						
	Did you meet the size goal'?		✔			Close to lower limit in March release	
#22a6	Dates of release						
	Did you meet the release date goal?		✔			Release on-site	
#22a7	Location of release						
	Did you the release the fish at the specified location?		✔			Discussion	
#22b	Are fish reared in the subbasin or acclimated in the subbasin?						
	Are the fish reared in the subbasin'?		✔			Discussion	
	Are the fish acclimated in the subbasin?		✔			Discussion	
#22c	Is the release strategy appropriate for the program?			✔		Concerns with temperature during May release	Need ability to adjust temperatures prior to release

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Corn pliance
		N/A	Yes		No		
#23	Transportation facilities						
	Do transportation equipment and personnel receive disinfection before and after use?	✔				No transportation used at this facility	
	Disinfection of' fish tank interior using a solution of 200 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?	✔				" "	
	Disinfection of fish transport vehicle exterior using high pressure steam (11 5-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes'!	✔					
	Disinfection of fish transport vehicle (cab) using 600 ppm quatemary ammonia compounds (1.5 ml of 50% stock solution/liter water)?	✔					
	Disinfection of other equipment including fish pumps, nets, egg sorters, waders, boots. rain gear, hoses and other equipment use one of' the following solutions?	✔					
	200 ppm chlorine for 30 minutes 600 ppm quatemary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes	✔					
	Do personnel wear protective garments when handling fish eggs, or cultural water?	✔					
	Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?	✔					
	Is a daily service inspection completed before starting up and leaving for the day?	✔					
	Does the tish transport unit receive an inspection prior to loading'?						

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#23 (cont)	I'ransportation facilities						
	Does a pre-loading inspection covering the following: tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading the fish in the transport unit'?	✔				No transportation used at this facility	
	Do hauling criteria include checking the fish 45 minutes to 1 hour after loading occur?	✔					
	When fish are active and systems are functioning properly. is the oxygen concentration reduced and maintained approximately 8 ppm?	✔					
	Is water temperature in the transportation unit maintained within 42-48°F range?	✔					
	Do fish releasing procedures include the following criteria?	✔					
	Releasing the fish at the correct release site or into the correct water body.	✔					
	Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.	✔					
	The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.						

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		/A	Yes	?	No		
#24	Evaluation practices						
	Has the hatchery conducted fishery contribution studies to:		✔			Discussion	
	Determine the requirements for evaluating and improving management programs'!		✔			Discussion	
	Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✔			Discussion	
	Develop guidelines that define if the proper stocks of fish are currently being used?		✔			Discussion	
	Determine which management units contribute to a specific fishery and the time periods of those contributions?		✔			Discussion	
	Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✔			Discussion	
#25	Training practices						
	Does the hatchery have a training schedule for its staff?		✔			Review of records/Discussion	
	Does each staff member have a personal training plan approved by a supervisor and revieved annually?		✔			ieview of records/Discussion	
	Does the hatchery routinely exchange training details between other hatcheries and agencies'?		✔			ieview of records/Discussion	
	Does the hatchery encourage and reward off-duty training of staff'!		✔			ieview of records/Discussion	
	Does the hatchery conduct monthly staff meetings?		✔			Review of records/Discussion	

Table 1 **Spring** Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				**Basis** for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#26	Are monthly hatchery monitoring visits being conducted by a qualified fish health specialist?		✔			Review of records/Discussion	
#27	Are all of the functions of the hatchery yearly monitoring visits being completed as described below?		✔			Review of records/Discussion	
#28	Is the hatchery following accepted sanitation procedures?						
	Are there any sources of pathogen-free water, especially for incubation and early rearing?				✔	Discussion	No major problems
	Are the hatchery sanitation procedures understood and being followed?				✔	Inspection of facilities/Discussion. Cannot use iodophone to treat eggs	Need separate drain system for incubation system when treating eggs; should not be required unless pathology does not request
#29	**Are water quality parameters being followed?**						
	Are the following water quality parameters within criteria? (PM #5a-5h)						
	Water temperature		✔			Review of records/Discussion	
	Dissolved gases		✔			Review of records/Discussion	
	Chemistry			✔		CO_2 and chlorine data missing	Run analysis
	Turbidity		✔			Review of records/Discussion	
	Alkalinity and hardness		✔			Review of records/Discussion	
	Nitrite		✔			Review of records/Discussion	
	Contaminants			✔		Lindone & Guthion missing	Run analysis
	Go to PM #21						

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#30	**Are incubation and rearing standards being followed?**						
	Are the incubation practices being following the IHOT incubation criteria? (PM #18)		✔			Review of records/Discussion	
	Are the rearing practices following the IHOT criteria? (see PM #19)		✔			Review of records/Discussion	
	Go to Rearing practices, PM #18-PM #19						
#31	Are egg and fish transfer/release requirements met?		✔			Discussion	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#32	**Is the hatchery's program outlined in a subbasin management plan?** Go to subbasin plan, PM # 1		✔			Columbia Basin System Planning Production Plan, U.S. vs. Oregon, Columbia River Fish Management Plan	
#33	**Is the hatchery operating under a current hatchery operational plan?** Go to operational plan, PM # 2		✔			Review IHOT & Spring Creek 5-Year Plan	
#34	**Is a hatchery monitoring and evaluation plan in place?** Go to hatchery monitoring and evaluation plan PM # 3		✔			Review hatchery Monitoring and Evaluation Plan	Include Monitoring and Evaluation Plan in IHOT Operational Plan

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	3	No		
#35	**Does the hatchery program meet requirements established in the regional hatchery policies and subbasin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, and spawning and egg-take protocols.**						
	Does the hatchery program meet the requirements for the following: (PM #1-PM #2)		✔			Review of records/Discussion	
	Species protocols? (PM #4a)		✔			Reviewof records/Discussion	
	Stock protocols? (PM #4a)		✔			Reviewof records/Discussion	
	Broodstock collection location protocols? (PM #41)		✔			Review of records/Discussion	
	Broodstock numbers protocols? (PM #42)		✔			Review of records/Discussion	
	Broodstock collection strategy protocols? (PM #41)		✔			Review of records/Discussion	
	Spawning protocols? (PM #42)		✔			Review of records/Discussion	
	Egg-take protocols? (PM #42)						

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#36	**Does the hatchery's performance meet requirements outlined in the regional hatchery policies and in subbasin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location at release.**						
	Percent smoltification (PM #22a1)	✔				No goal found	
	Rearing density (PM #22a2)		✔			Review of records/Discussion	
	Disease condition (PM #22a3)		✔			Review of records/Discussion	
	Number at release (PM #22a4)		✔			Review of records/Discussion	
	Size at release (PM #22a5)		✔			Review of records/Discussion	
	Date of release (PM #22a6)		✔			Review of records/Discussion	
	Location at release (PM #22a7)		✔			Review of records/Discussion	
#37	**Are fish reared in the subbasin or acclimated in the subbasin?** See PM #22b		✔			Discussion	
#38	**Is the release strategy appropriate for the program?** See PM #22c			✔		Concerns with temperature during May release	Need ability to adjust temperatures prior to release

Table 1 Spring Creek National Fish Hatchery Compliance (**Tule** Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#39	For new programs, has a broodstock collection plan been developed?						
	Is the broodstock collection plan written?	✔				Existing Program; does not apply	
	For a non-captive broodstock program:						
	Was an unbiased, representative sample collected?	✔				Existing Program; does not apply	
	Was the recommended number 01 broodstock collected?	✔				Existing Program; does not apply	
	For a captive broodstock program:						
	Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✔				Existing Program; does not apply	
	Were full-sib crosses avoided?	✔				Existing Program; does not apply	
	Is the broodstock collection plan understood and being followed by staff?	✔				Existing Program; does not apply	
#40	For a new program, was the donor selection outline followed in selecting the hatchery broodstock?						
	Is a donor selection plan written?						
	Was the donor selection outline followed in the selecting the broodstock?	✔				Existing Program; does not apply	
	Was the target stock recommended in the donor selection process actually used?	✔				Existing Program; does not apply	
		✔				Existing Program; does not apply	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#41	For existing programs, were the broodstock collection procedures followed?						
	Is the broodstock collection plan written?		✔			Review broodstock collection plan	
	Does the broodstock collection plan follow the guideline:		✔			Discussion	
	Was an unbiased, representative sample collected?		✔			Discussion	
	Was the recommended number of broodstock collected'?		✔			Discussion	
	Were the broodstock collection procedures in hatchery operation plan understood and followed'?						
#42	Were the appropriate number of spawners, male/female ratios, and Fertilization protocols used?						
	Are the spawning protocols written?		✔			Review spawning protocols	
	Are daily or weekly spawning logs available?		✔			Review of records	
	Were the appropriate number of spawners used?		✔			Review of records	
	Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?		✔			Discussion	
	Was the sex-ratio within the limits given in the performance standards?		✔			Discussion	
	Were the fertilization protocols followed?		✔			Discussion	
	If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?	✔				Discussion	

Table 1 Spring Creek National Fish Hatchery Compliance (Tule Fall Chinook) For Facility Requirements

PM #	Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
		N/A	Yes	?	No		
#43	Is there a genetics monitoring and evaluation program in place?						
	Is a genetics monitoring and evaluation program available?				✔	Discussion	Genetics Monitoring and Evaluatior plan under development
	Does the plan address the following elements listed in IHOT:						
	Does the program have elements needed to meet evaluation goals 1-4?	✔				" "	
	Has a qualified geneticist reviewed and endorsed the program (goal 5)?	✔					
	Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?	✔					
	Is it understood and followed by stafl?	✔					

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions arc organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control to those that require a change in agency policy or procedures to those that have a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or PM not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but not clearly definable at this time

Remedial Actions at Spring Creek National Fish Hatchery (Tule Fall Chinook)

This section presents the corrective actions required to bring the Spring Creek National Fish Hatchery Tule Fall Chinook program into compliance with the IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 2).

The cost estimates presented in this section ‘are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates (± 40%).

More importantly. the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 2. Remedial Actions Required at Spring Creek National Fish Hatchery (Tule Fall Chinook)

Remedial Action Required	Cost	PMs[2]
Type 1 - Non-compliance issues resulting from items beyond human control or PM not relevant for this hatchery		
Need better adult returns (the smolt-to-adult goal is 1.5%; the 5 year average for the hatchery is 0.33%)	-----	4h
Do not have disease-free water supply (does not appear to be a serious problem)	-----	5h
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Develop genetics monitoring and evaluation plan for IHOT Operations Plan		43
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor chemistry parameters on routine basis	$200/year	5c,29
Monitor contaminants on routine basis	$400/year	5g
Type 4 - Remedial actions requiring significant capital expenditures		
Modify incubation water supply to allow water hardening of eggs in iodophor (costs will depend strongly on operational constraints and safety considerations that would be determined in design)	$150.000	21,28
Type 5 - Remedial actions that may require significant capital expenditures but not clearly definable at this time		
Present release facility stresses the fish too much	?	13
Need ability to adjust water temperatures during May releases	?	22c

[2] PMs are Performance Measures that were extracted from the IHOT 1995 report. The IHOT Performance Measures are listed in Table 1 in Section 3 in numerical order.

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds and Hatcheries

This section presents the audit iindings for thc Spring Creek National Fish Hatchery's Tule Fall Chinook contribution of adult fish to fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For **some** species, this may include fish caught as 2, 3, 4, 5, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4-5 years after the fish have been released from the hatchery.

Table 3. Adult Contribution to Fisheries, Spawning Grounds and Hatcheries - Spring Creek National Fish Hatchery (Tule Fall Chinook)

Year	Fisheries[3] (Broodyear)	Spawning Grounds[3] (Broodyear)	Hatchery[3] (Broodyear)	Smolt to Adult Survival (percent)
1981				
1982				
1983				
1984	5,349		962	0.0454
1985	12,250		1,215	0.1271
1986	37,777		6,534	0.4164
1987	21,202		5,660	0.3035
1988	61,303		17,286	0.5134
1989				
1990				
1991				
1992				

[3] Data obtained from Missing Production Groups Annual Reports or from the Regional Mark Information System database.

Section 6

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the Federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program were estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 4 shows the annual operating expenses for the Spring Creek National Fish Hatchery (Tule Fall Chinook).

Table 4. Annual Operating Expenses - Spring Creek NFH (Tule Fall Chinook)

Component	1993	1994	1995
Personnel Costs	$450,674	460,984	458,152
Operational Costs	$224,460	254,178	290,400
Capital Costs	$146,731	83,743	41,487
Indirect Costs	$245,492	237,335	235,986
Lumped Hatchery Costs[4]			
Lumped Third-party Costs			
Total Hatchery Costs	$1,067,357	$1,036,240	$1,026,025
Source of Funds			
U.S. Fish & Wildlife Service	<1%	<1 %	<1%
U.S. Army COE	60	60 .	60
NMFS	40	40	40
Program Production (lb)			---
Total Production (lb)			---
Program as Percent of Total	100%	100%	100%
Program Costs	$1,067,357	$1,036,240	$1,026,025

[4] If it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.